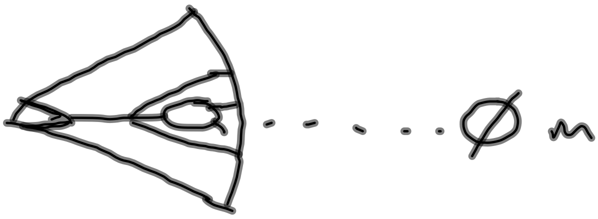
Final Exam Review 4th Block 1.6.12

An average force of 587.5 N is exerted as the Coyote stretches the string back on a giant bow. The string is moved back a distance of 0.744 m as he inserts his body in the bow. His mass is 14.57 kg, and it takes him 3.0 s to do this task. He points himself in a horizontal direction, and when the Road Runner passes he takes off from the bow. How fast is he going at his maximum horizontal velocity?



$\theta = 0°$ $\longrightarrow \bar{F}$ $\longrightarrow \bar{d}$

$\cos 0° = 1$

$$W = \Delta E$$

$$= (K_f - K_i^{\nearrow 0}) + (U_{gf} - U_{gi})^{\nearrow 0}$$

* doesn't change height

* starts from rest

$$W = K_f$$

$$Fd\cos\theta^{\nearrow 1} = \frac{1}{2} m v_f^2$$

$$v_f = \sqrt{\frac{2Fd}{m}}$$

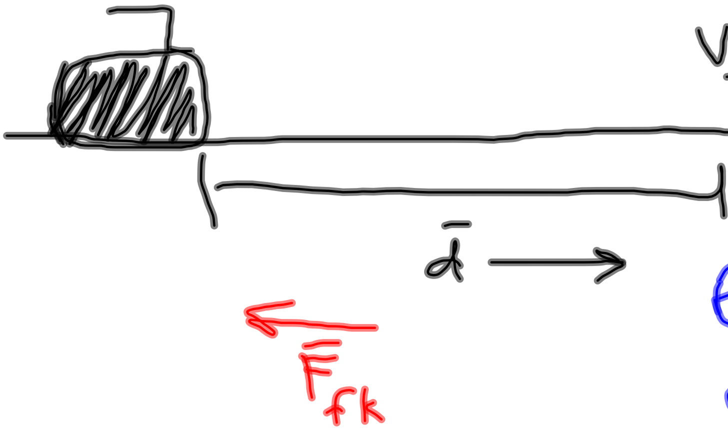
$$= \sqrt{\frac{2(587.5\ N)(.744\ m)}{14.57\ kg}}$$

$$= 7.75\ m/s$$

On a frozen pond, a person slides a 10.0 kg curling stone, giving it an initial speed of 2.2 m/s. How far does the curling stone move if the coefficient of kinetic friction between the curling stone and the ice is 0.10?

$V_i = 2.2 \text{ m/s}$

$V_f = 0 \text{ m/s}$



$\theta = 180°$

$\cos(180°) = -1$

$$W = \Delta E$$

$$= (K_f - K_i) + (U_{gf} - U_{gi}) \quad (K_f \to 0,\ U_{gf} - U_{gi} \to 0)$$

$$F_{fk}\, d \cos\theta = -\tfrac{1}{2} m v_i^2 \quad (\cos\theta \to -1)$$

$$d = \frac{m v_i^2}{2 F_{fk}}$$

$$= \frac{(10\text{ kg})(2.2\text{ m/s})^2}{2(9.8\text{ N})}$$

$$= 2.47\text{ m}$$

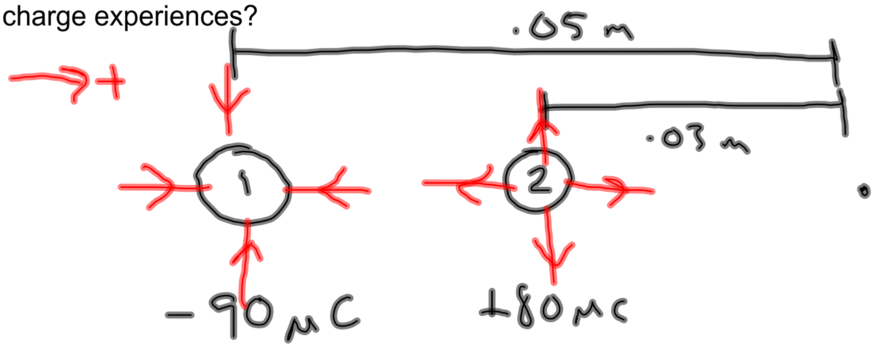
$$F_{fk} = \mu_k F_N$$

$$= \mu_k m a_g$$

$$= (.1)(10\text{ kg})(9.8\text{ m/s}^2)$$

$$= 9.8\text{ N}$$

Two charges are arranged in a line. Charge 1 has a value of -90 microC and is located at the origin, charge 2 has a value of +80 microC and is located at x = 2 cm.
a) Find the value of the electric field at the point x = 5 cm.
b) If a charge of +50 microC is placed at this point, what is the electric force that the charge experiences?



a) $\bar{E}_{net} = \bar{E}_1 + \bar{E}_2$

$$= \frac{-k|q_1|}{r_1^2} + \frac{k|q_2|}{r_2^2}$$

$$= (8.99E9\ N\cdot m^2/c^2)\left[-\frac{(90E\text{-}6\ c)}{(.05\ m)^2} + \frac{(80E\text{-}6\ c)}{(.03\ m)^2}\right]$$

$$= 4.75E8\ N/c$$

b) $\bar{E} = \frac{\bar{F}}{q}$

$\bar{F} = q\bar{E}$

$$= (50E\text{-}6\ c)(4.75E8\ N/c)$$

$$= 23750\ N$$

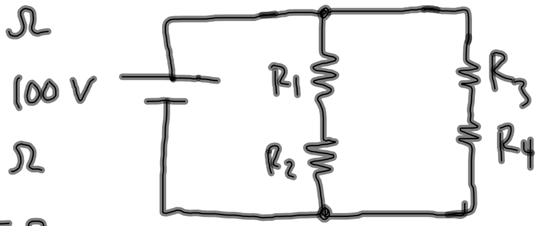
Find all V's and I's:

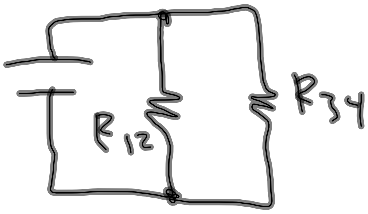
$R_1 = 70\,\Omega$

$R_2 = 90\,\Omega$

$R_3 = 110\,\Omega$

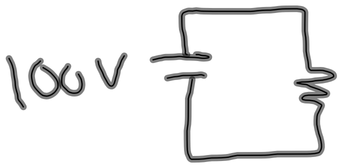
$R_4 = 85\,\Omega$





$R_{12} = 160\,\Omega$

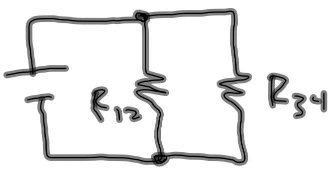
$R_{34} = 195\,\Omega$



$R_{eq} = 87.9\,\Omega$

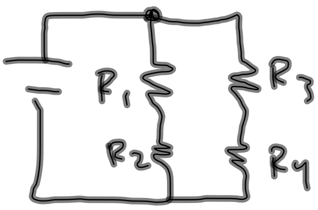
$V = IR$

$$I_{total} = \frac{V_{battery}}{R_{eq}} = \frac{100\text{ V}}{87.9\,\Omega} = 1.14\text{A}$$



$$I_{12} = \frac{100\text{V}}{R_{12}} = 0.625\text{A}$$

$$I_{34} = \frac{100\text{ V}}{R_{34}} = 0.515\text{ A}$$



$V_1 = I_{12} R_1 = 43.8\text{ V}$

$V_2 = I_{12} R_2 = 56.2\text{ V}$

$V_3 = I_{34} R_3 = 56.4\text{ V}$

$V_4 = I_{34} R_4 = 43.6\text{ V}$